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Building the European Network
For Lifelong Competence Development

TENCompetence IST-2005-027087

Project Internal Deliverable Report

ID2.4 - Analysis Report

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Abstract (for dissemination)	This internal deliverable contains the Gap Analysis of the Initial Requirements of TENCompetence project. The main analysis are: 1.- Domain Model vs. Objectives 2.- High Level Use Cases vs. Domain Model 3.- High Level Uses Cases vs. Objectives 4.- Aspects vs. High Level Use Cases 5.- Pilots vs. Objectives
Keywords List	Gap Analysis, Research Objectives, Domain Model, High Level Use Cases, Aspects, Pilots

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1 Introduction

This report constitutes the second step in the methodology we are following to collect user requirements. This task, usually complex, is more in ambitious research projects as TENCompetence in which the quick development of prototypes is required to test and validate the concepts that are being investigated and where the potential users have not a clear idea about the implications that such as investigations could have in their organisations.

For this reason TENCompetence chose the **Unified Process** (an open version of RUP – Rational Unified Process-) as the main development framework as it conjugates a robust methodology with the rapid development of prototypes that are refined in several cycles allowing for an increasing understanding of the problem through successive refinements.

Inside this methodology, collecting user requirements constitute the starting point of the conception phase. For its initial definition we decided to use **scenario-based software development techniques**, method not common in UP but profusely used in other methodologies such as **GDD** (Goal Directed Design) or **USBD** (Unified-Scenarios Based Design).

According to UP, Use Cases come from customers and users, and subsequently require prototyping, iteration (of code), and repeated customer/user involvement to validate, reconcile, and consolidate the Use Cases and the software defined by the Use Case. This process is predicated on the assumption that it is impossible to make sense of requirements until you have written some code and put it in front of users and customers, because there's really no anticipating or accounting for what people will actually want. Alternatively, **it is hold that anticipating and serving human needs can be achieved in advance, using scenarios**. By determining motivations (rather than simply tasks), we can anticipate and proactively serve needs and requirements our users and customers can't yet identify. This stems the flow of requirements delivered after design is completed.

TENCompetence user requirements' definition process started with the collection of scenarios and specific use-cases conceived by the project research groups and potential users. In these scenarios they expressed their vision of the future use of tools that are to be developed. After a first analysis, the scenarios were grouped in six use-cases (see Initial User Requirement Report) that expose the high level functionality that TENCompetence's integrated system should offer to its potential users.

These High Level Use Cases were completed with others coming from the "Aspect Work Packages" (WP8: Learning Networks, WP7: Competence Development Programmes, WP6: Unit of Learning & Learning Activities and WP5: Knowledge Resources). Additional use cases were created to cover the required functionality of the pilots (WP4) in which our research will be tested and validated.

However, this heterogeneous set of scenarios and use cases, collected from diverse sources, presented several incoherencies and lacks when considering them as a whole.

Moreover, other considerations have to be taken in account. First, TENCompetence is conceived over a theory, which is expressed through a **Domain Model** [Annex B, Koper, R., 2006]. This model constitutes the project background; therefore it should be the reference framework for future developments. Second, the consortium has imposed a concrete set of **research objectives** [DOW v3 28-9-05] that should guide the developments too. And third, the research outcomes should be validated, in successive experimentation phases, in real environments (**pilots**) that, of course, have their own needs.

Summing up, alter the first phase of requirements collection four factors have to be taken in account: (1) the main system functionality expressed in the **six high level use cases** and in the **aspect work packages uses cases**, (2) the underlying theory expressed in the **domain model,** (3) our **research objectives** and (4) our **experimentation needs**.

Next diagram expose the main relationships between these four factors:

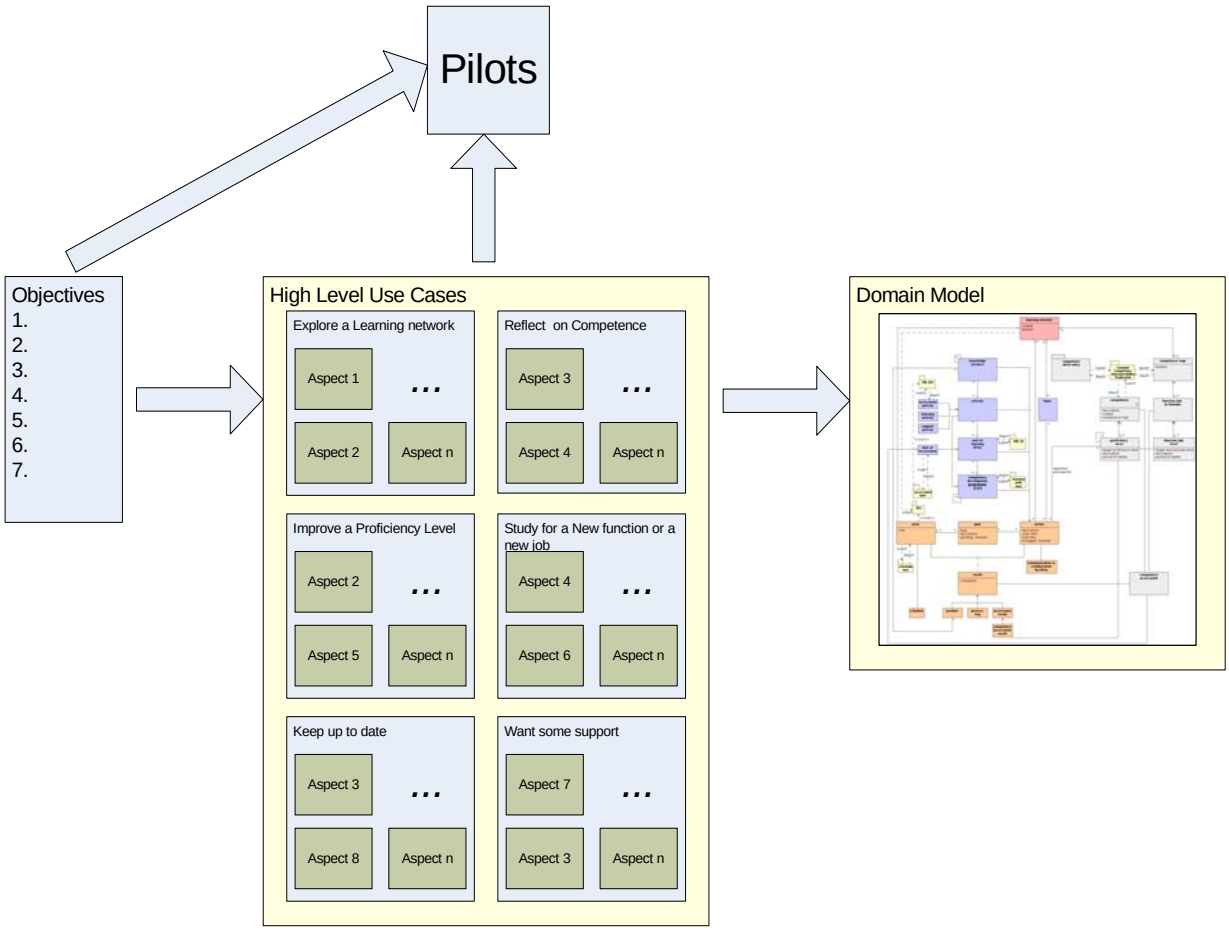

Figure 1: Relations between components

From the analysis of this complex scenario, different questions arrive that have to be answered before going forward:

- Do we reach our research objectives if we develop the system that has arrived from the analysis of the scenarios proposed by the different research groups and potential users? (section 4). If we are not able to reach them, how do we have to extend this vision?
- Does our theoretical model fulfil our research objectives? (section 5). In case it is not possible, how can we extend this model?
- Do the theoretical concepts support our vision of the project expressed in the six high level use cases? (section 6). In case we get a negative answer, do we have to limit our vision to ensure the viability or do we have to extend our theoretical base to support this new vision?
- Are the proposed experiments adequate to validate our researches? In the same way, is the current system functionality enough to complete the needs of the experimentation environments? (section 7). If they are not sufficient, how do we have to modify these experimentation scenarios to complete our needs?

The final objective of this report is to give answer to these questions detecting in the process possible gaps between current specifications, the base theory, our research objectives and the experimentation environments.

As a result several recommendations will be proposed that should be taken in account in the second development cycle (DIP-2). These recommendations could suppose: to extend current system functionality in the next step of requirements elaboration (Extended Use Case model), to modify the Domain Model including new concepts present in the scenarios, to change aspect work packages' research roadmaps and/or to conceive new experimentation environments that permit the validation of our outcomes.

In next chapters, we will try to answer all previous questions analysing the relationships between previous issues trying to find possible gaps in any direction. Each chapter will be followed by general conclusions that will be sum up in a last section of recommendations.

Although all the information in which current cross-analysis is based is available in previous deliverables as well as in internet, we have considered necessary to add most relevant one in this report including it just when required or in appendices.

Finally, current analysis is of special relevance for WP3 (system architecture) and WP4 (pilots). For this reason a special assessment has been required. Details are provided in Appendix D (Appendix D: Assessment from WP3 and WP4).

2 Research Objectives

A brief summary of our seven research objectives follows:

1. Support for new, promising, **innovative pedagogical and organisational approaches** for lifelong competence development that use the possibilities of new technologies available. This includes an **integration of formal and informal learning**.
2. **Help learners** to get an overview of all the possible formal and informal knowledge resources, units of learning, programmes and learning networks that are available, and **to identify the most appropriate for their needs and background**.
3. **Stimulate the pro-active sharing** of knowledge resources.
4. Provide **support for competence assessment**, including the assessment of the competences of applicants, employees and learners who have studied and worked in a variety of formal and informal settings.
5. Provide effective and efficient **support for users during the performance of the various tasks** in various roles (learner, teacher, assessor, etc.).
6. Provide support for **decentralized, self-organized and empowered management**.
7. **Integrate four** different types of models and tools used for competence development, i.e. tools and models for:
   a. **knowledge sharing & management**,
   b. the creation & use of **learning activities and units of learning**,
   c. creation & use of **formal and informal competence development programmes** for lifelong learning and
   d. creation and use of **learning networks & learning communities** for lifelong learning.

3 High Level and Aspect Use Cases

Following there is a brief description of the six high level use-cases. The models that describe them can be found in Appendix B: High Level Use Cases. More details can be found in the Initial Requirements Report [ID2.1]

1. **Improve Proficiency Level:** the learner's motivation in this use case is to improve his/her proficiency level for a specific competence.
2. **Keep up-to-date:** Knowledge, skills, etc. change over time and professionals must update their competences to maintain their proficiency level. The mission of this use case is not getting a better job or acquiring a higher proficiency level, it's preventing the learner's proficiency level from going down.
3. **Reflect on Competences:** from the current Learner's proficiency levels, the system will show him/her all new functions/jobs that match or are compatible with his ePortfolio. Based on this information, the learner will decide how to proceed.
4. **Study for a New Function or Job:** The motivation of the learners in this use case is the wish or the need for the development of competences and skills for a new job or a new position. The goal of this use case is to find or create appropriate competence development programmes (CDPs) for the development of competences and skills that are necessary to master a new function or a new job.
5. **Want some Support:** The motivation of the learners in this use case is the need for support for an action. The objective of this use case is to provide support and to rate the received support.
6. **Exploring a Learning Network**: the learner's motivation is to explore a Learning Network looking for topics, actions, issues, etc., that suits his/her aspirations and/or wants. It may be considerer as a prerequisite to other use-cases.

The functionality described in these high level use cases can not be understood without considering the ones described by the aspect work packages: Learning Networks, Competence Development Programmes, Unit of Learning & Learning Activities and Knowledge Resources (see "Appendix C: Aspects" for main use cases of this components and ID2.1 for a detailed description).

A first important observation is that all high-level use cases are centred on the learner. **No use cases are provided to describe how teachers, mentors or other people in the role of author create or manage knowledge resources**. In fact, there is **no distinction between the possible types of learners or actors**. This gap should be solved in the next phase (elaborated use cases model).

This general remark should be completed with other specific for each high level use case as follows.

3.1 Explore a Learning Network

- **It is not clear the difference between subscribe and select a Learning Network**. They must be not the same, but are identical according to the text of the some of the high level use cases.
- It is not clear if it is possible to **access to Learning Network without being subscribed to it.**
- It is not clear if it possible to have access to the full list of learning networks or if it is always necessary for the user to express his/her interest.
- How can a user repeat a search if he/she wants other results?

3.2 Improve Proficiency Level

- It is not clear what happens after completion of a course. Is there any kind of verification of acquired competences in all cases or only in some courses?
- How do we look for a new competence to satisfy a learning need? Which is the relationship between competence and Learning Network? How do we trace the relationship?
- It seems that user's portfolio is not updated when the user increases his/her P**roficiency level.**

3.3 Keep up to date

- It is not clear which information is used to create the list of activities as result of Keep-up-to-date high level use case and who is the process owner.
- Is there any user intervention in the Keep-up-to-date searches?
- Again, it seems that user's portfolio is not updated. Moreover, ePortfolio seems to be used for logging the different learning activities but it is not possible considering ePortfolio as an external system. Clarifications about how the log process and its relationships with the ePortfolio are required (Valid for keep up to date and reflect on competences).

3.4 Reflect on competences

- It is not clear what happens if all competence levels are not filled? Is there any error message?
- Where is the refection report stored?

3.5 Study for a new function or a new job

- When does the leaner select a LN, before or after looking for a CDP? In the text it is not clear.
- The two opportunities to find CDPs are not clear, nor in the text nor in the diagrams.
- When is the user profile updated?

3.6 Want some support

- Here is a gap between the text and the UML diagram, as in the text it is said that "based on a support request the system will search for a support provider" and in the diagram this is not reflected.
- A facilitator can register in the system as a support provider, but it is not clear how they do that and who will validate them.
- Which information is reflected in the portfolio and which information in the profile?
- In the diagram, profile is not mentioned although it is mentioned in the text.

4 Does current project vision cover our research objectives?

The objective of this chapter is to analyse if the future development of the **six high level use cases**, in other words our project vision, is enough to fulfil the **seven research objectives** as they are expressed in the project description of work [DoW].

4.1 Objective 1

*Support for new, promising**, innovative pedagogical and organisational approaches** for lifelong competence development that **use the possibilities of new technologies available**. This includes an **integration of formal and informal learning**.*

The high level use cases are quite goal-directed and aimed at improving one's competence level, or to stay up-to-date. What is interesting to observe, is that the use cases have a very learner-centred perspective: instead of describing how a learner selects material from the available resources the use cases describe the learner pursuing a specific goal. The competence-based approach – in which the learner can express interest in improving certain competences (Use Case 1), keep up-to-date (UC2) for a certain profession or reflect on his/her current competence levels (UC3) – seems to be a good basis for new approaches and is in line with current literature on lifelong learning.

Due to the focus on competences, **informal learning has not been described detailed enough.** It is implicitly assumed that learners will make use of formal units of learning to reach their goals. Therefore, **a better coverage of informal learning in the high level use-cases is required.**

4.2 Objective 2

Help** learners to get an overview of all the **possible formal and informal knowledge** resources, units of learning, programmes and learning networks that are available, and to **identify the most appropriate for their needs and background.

The first three high level use cases are focused to offer learners several alternatives to complete their objectives. However, they refer only to the actions related to Competence Development Programmes, Learning Activities and Units of Learning **leaving outside the Knowledge Resources as it's required for completing current objective.**

In the use case 'Explore a Learning Network', it is described that learners may subscribe to learning networks, and are able to search for relevant learning networks by selecting issues and topics. As a result the learner 'will receive a full list of relevant Learning Networks'. Stated at this, the use-case may be a bit too limited. As is currently being explored, **various graphical overview tools may perform better in reaching the goal of finding relevant learning networks.**

4.3 Objective 3

Stimulate the pro-active sharing of knowledge resources.

All use cases are centred on the learner wanting to reach a goal for him or her-self. The use cases on learning networks as well describe the learner as someone who consumes rather than contributes. So **this objective is not covered by the high level use-cases**.

4.4 Objective 4

Provide support for competence assessment, including the assessment of the competences of applicants, employees and learners who have studied and worked in a variety of formal and informal settings.

Competence assessment is dealt with at several points in the use cases. Interestingly, the most specifically mentioned type of assessment is self-assessment – the learner expressing interest in acquiring new competences not reflected in the ePortfolio, or estimating his/her competence level manually. Implicitly, it is assumed that competence assessment takes place behind the screens and is reflected in the ePortfolio.

4.5 Objective 5

Provide effective and efficient support for users during the performance of the various tasks in various roles (learner, teacher, assessor, etc.).

The use cases are stated in a very concise, high-level manner. They describe *what* actions learners may perform**, but not *how* they will be *supported***. Several hints are provided, such as 'after selecting the competence that the learner wants to improve, he/she will be able to search and subscribe to the different actions available…'. **This suggests the availability of effective and efficient support, but does not provide any hints on how this will be provided.**

4.6 Objective 6

Provides support for decentralized, self-organized and empowered management.

As we have said, high level uses-cases are learner-centred: the learner expresses his/her interest in improving his/her proficiency level, keep up-to-date or he/she may want to look for specific actions that allow him/her to access to a new job/position. Especially relevant for this objective in the use case "Reflect on Competences" in which the learners receive information about their current situation in front specific functions or jobs. From this information they will decide how to proceed. **All this use-cases offer different ways to self-organised learner's training process without establishing a centralised management process**.

4.7 Objective 7

Integrates four different types of models and tools used for competence development, i.e. tools and models for
a) knowledge sharing & management,
b) the creation & use of learning activities and units of learning,
c) creation & use of formal and informal competence development programmes for lifelong learning,
d) creation and use of learning networks & learning communities for lifelong learning.

As stated at the start of the section, the use cases describe on a very high level how units of learning, competence development programmes and learning networks may be *used* (although they describe *what* learners may do rather than *how* they do it). **Tools for creation and management are not covered by the use cases** and should be included in the elaborated use-case model

4.8 Concluding Remarks

From the above it may have become clear that the use cases provide a rather general view on the TENCompetence objectives, although they do not describe how they cover them. The use cases might be considered as an alternative explanation of the TENCompetence domain model; whereas it would have been more useful if the use cases would have zoomed into some elementary, essential actions to be supported by the system. In our opinion, it would be worthwhile to select a set of exemplary use cases that do not try to cover the system as a whole and to use these use cases *complementary* to the domain model.

As has been noted above, **the use cases mainly describe formal learning activities. This seems to be a risk in many projects involving novel informal learning scenarios**. In order to correct this, some initiatives have already been taken to provide the TENCompetence project with **more stimulating scenarios on informal learning.**

The main critique on the use cases is similar to the main critique on the domain model (see below): **they do not cover the creation or management of learning resources. We would strongly advice to also consider the author perspectives.**

Finally, high level uses-cases offer support to learners or employees to select most suitable actions to reach a goal. However these actions refer to Learning Networks, Competence Development Programme, Learning Activities or Unit of Learning **forgetting always Knowledge Resources that, as it has been said, are essential in informal learning scenarios.** Moreover, **it is necessary to include more details about how the system will stimulate the sharing of knowledge resources**.

5 Does our theoretical model cover our research requirements?

To answer this question we will analyse in which manner our research objectives (see above) are covered by the domain model. That is, if the defined classes in the conceptual model and their relationships are enough to fulfil said objectives.

The central element of the description of the domain model is an UML diagram. Several classes can be recognized within the model, which depict actors, learning resources, competence development programmes, assessment functionality and a model of competences. Whereas such a graphical diagram provides a concise view on the different concerns involved, it is hard to understand the diagram without a textual description – at least it is hard to figure out whether the reader's interpretation matches the author's intention. For this reason, an extensive vocabulary is provided, which describes the various classes involved. Unfortunately, **the vocabulary does not describe the relations between the classes**. So, even using the vocabulary, it is still up to the reader to imagine, for example, which is the relation between 'competence assessment' and 'unit of assessment'.

On itself, this is not a big issue, as the domain model is intended as a starting point for the research and development work done in the TENCompetence project. An overly detailed domain model would restrict the choices in which direction the research may go to. However, as it will become clear in the remainder of this section, it is hard to judge to what extent the domain model covers the objectives of the TENCompetence project. For this reason, **we limit ourselves to listing our observations and providing suggestions for improvement** – improvements that may only become feasible at a later stage of the project in cycle 2, as this is the end of cycle 1.

A general vision of the domain model can be found in the Appendix A: Domain Model. The description of the main seven research objectives can be found in previous chapter.

5.1 Objective 1

*Support for new, promising**, innovative pedagogical and organisational approaches** for lifelong competence development that **use the possibilities of new technologies available**. This includes an **integration of formal and informal learning**.*

Four main questions arrive:

- **Does the domain model support innovative pedagogical models?**: the model doesn't impose any restriction regarding the pedagogical model it supports. Its main components as the Learning Networks or the Competence Development Programme together with the communication and collaboration facilities suggest that there is support for most of the pedagogical models especially for those that are learner-centred or that are based in group collaboration. Moreover, from the vocabulary description of the domain model it does not become clear which specific learning activities are envisaged. However, it is mentioned that standards like SCORM and IMS Learning Design may be used for this purpose Standards that, of course, are conceived to support any kind of pedagogical model.

- **Does the domain model support innovative organizational models?:** the domain model offers support to Learning Networks and Competence Development systems, two of the most innovative organisational models that are being proposed in educational systems. This fact together with the different ways of assessment, specially the reference to innovative ways to assess competences and with the different roles that actors can take depending on the context, let us to affirm that the model support most of the structures of the organizations that are focused to lifelong competence development. However, the definition of more complex relationships between actors (i.e. dependencies) or the definition of workflows (i.e. approve or deny the launch of pedagogical activities or the subscription to a learning network) should enrich the model**.**
- **Does the model use the possibilities of new technologies available?:** the model doesn't define which technologies should be applied for its implementation. However, some innovative services are defined as the ones for rating, navigation or positioning. Moreover, it encourages the profuse use of international standards.
- **Is the domain model able to integrate formal and informal learning?:** the domain model mainly provides an architecture for the organization of learning material. It separates formal units of learning and general knowledge resources, which is a good start for integrating formal and informal learning. The differentiation between learning activities, support activities and assessment activities offers several possibilities for the development of informal learning.

In summary, **the domain model is conceived to support informal and formal learning**. **It doesn't impose any restriction to the pedagogical model applied and requires the use of innovative technologies to support some of its functionality**. Learning Networks and Competence management are two of the most innovative organisational models that are currently under development. So, **no gaps have been found regarding this objective**.

5.2 Objective 2

Help *learners to get an overview of all the possible formal and informal knowledge resources, units of learning, programmes and learning networks that are available, and to* ***identify the most appropriate for their needs and background****.*

Two questions can be considered here:

- **Does the domain model help learners to get an overview of formal and informal knowledge resources, units of learning, programmes and learning networks?**: the classes Knowledge Resources, Activities (Learning Activities), Unit of Learning and Competence Development Programmes cover this part of the objective.
- **Does the domain model help learners to identify the most appropriate resources for their needs?**: the classes 'competence development programme' and 'learning network' cover this objective. An **actor may perform several actions on the CDPs, which include the provision of personalized overviews**, and **support for positioning and navigation**. The envisaged relations with the **competence observatory** and the associated proficiency levels for competences will support the creation of suitable interviews. According to the vocabulary, the domain model covers the design of routes or shared tracks, but how this will be achieved, remains unclear. Probably this kind of information shouldn't be reflected in the domain model, but it remains unclear where it must be reflected.

5.3 Objective 3

Stimulate the pro-active sharing of knowledge resources.

One class: 'communication & collaboration facilities' suggests the presence of tools for sharing of knowledge resources and learning experiences. Communication facilities services like chats, wikis, forums or VoIP (audio conferences) and shared white boards may be used as well as it's possible to integrate any other open service offered on the Internet. Is this way, at least the **tools for favouring the interchange of knowledge resources are present in the domain model**. However, the class "Communication & collaborative facilities" is only linked to the class "Action". According to this structure, **it is not possible to directly use collaborative tools to generate reference contents and learning material.**

The domain also considers the possibility of **establishing social exchange polices**. These polices should be focused on stimulating the proactive sharing of knowledge resources. Other facilities relevant in this context are the **notification service**, critical for ensuring the participation of huge communities, and the **monitoring** one that should be used for detecting difficulties within the learning networks and virtual communities (lack of participation, communication problems, etc.) and for refining current social exchange policies or creating news.

Another remark is that learning and knowledge resources are only accessible through learning networks, **external resources are in this way difficult to access**. A tool to search external resources will be useful.

5.4 Objective 4

***Provide support for competence assessment**, including the assessment of the competences of **applicants, employees and learners** who have studied and worked in a variety of formal and informal settings.*

Competence assessment is directly incorporated to the domain model and is available for all users of the learning networks. Specific classes are defined to complete competence maps with specific assessments for function or jobs in domain. Assessment is also present as a general activity in the learning networks covering units of learning and competence development programmes. Navigation and positioning services should provide the required support for users.

5.5 Objective 5

*Provide **effective and efficient support for users during the performance of the various tasks in various roles** (learner, teacher, assessor, etc.).*

As said earlier, the domain model contains two classes that describe the various actions and activities that an actor (learner, teacher, assessor, etc.) may perform. The prerequisites for providing support for these various tasks are available – modelling of competences and assessment services. **The support itself is not modelled yet and should become part of the description of the classes involved**.

5.6 Objective 6

Provides support for decentralized, self-organized and empowered management.

The management of learning resources (creation, modification, maintenance, and etcetera) seems not to be covered by the domain model nor anywhere else. The domain model appears to have the underlying assumption that the knowledge resources and units of learning are already available. **No details are given on how teachers or mentors are assumed to manage the available resources**. This appears to be a serious gap in the domain model, in particular as within the TENCompetence project it is assumed that actors may perform both the roles of consumers (learners that make use of the material) and providers (e.g. teachers that add, modify or comment knowledge resources). Even though it is implicitly suggested in the vocabulary that the latter kind of actions should be supported, no technical means (such as a **version managing system**) or organizational means (such as **peer reviewers** for guarding the quality of the resources) are mentioned.

5.7 Objective 7

Integrates four different types of models and tools used for competence development, i.e. tools and models for:
a) knowledge sharing & management,
b) the creation & use of learning activities and units of learning,
c) creation & use of formal and informal competence development programmes for lifelong learning,
d) creation and use of learning networks & learning communities for lifelong learning.
As mentioned at the former objective, the domain model seems to mainly cover the 'consumption' of learning material and knowledge resources. It appears to be implicitly assumed that all the material has been created. What the model does provide, is a good separation of concerns as far as the usage of the different kinds of resources (knowledge resources, units of learning, competence development programmes and learning networks) is concerned. This provides a good starting point for research on covering this objective.

5.8 Concluding Remarks

In summary, from the preceding subsections it may be concluded that, in principle, the **domain model provides a good reference for research within the TENCompetence** project to cover its main objectives. It provides a high-level separation of concerns and a vocabulary that can be used by all project partners. As is almost unavoidable at this early stage of the project, the domain model is quite general and provides mainly pointers as to where the research results on the core objectives need to be fit in. We expect that this will be elaborated at later stages of the project.

Moreover, the domain model could be improved including services as an external resources access tool, a version managing system or organizational services as peer reviewers for guarding the quality of the resources.
A more serious issue with the domain model is that **it hardly represents how the available resources may be created and manage**d (objectives 6 and 7). Whereas this might not be a big problem, it would be wise to invest time and effort to cover these objectives as well in the model. This will provide the involved researchers with a common view and vocabulary for exchanging insights and results on these objectives as well.

6 Does the domain model support our Project vision expressed in the high level use cases?

The objective of the following analysis is to determine if the domain model is able to cover all the requirements expressed in the high level use-cases as well as to determine if our current vision is enough or it has to be extended.

A first general remark is that, to avoid misunderstandings, **a more level of detail is required in the descriptions of the terms contained in the glossaries provided by both**: the domain model and the Initial User Requirement Report. For example, there are terms in the glossary of the domain model description that are not present at all at the use cases. (RSS, IMS QTI, competence observatory, common competence interoperability framework…).

6.1 High Level Use Case: Explore a learning network

Learning Networks are in the core of the domain model so they are clearly covered. Only we can make two remarks:

- In the domain model description, the learning network can contain different actors with different roles. In the use case "Explore a Learning Network", there is not any reference to role attributes.
- When there is a learning network with many actions but with no competence map defined, the competence assessment can cluster the activities to create a derived competence map. This function is not defined in the use case.

6.2 High Level Use Case: Improve Proficiency Level

Competence Maps and Actions (CDP, Learning Activities and Learning Units) are well supported in the domain model.

Portfolio is defined as an external service both in the domain model and in the high-level use cases as well as the positioning service (now in the aspects work packages). However, the domain model makes reference to an activity log process (linked to the monitoring services) that is not present in this high level use case or in others.

Assessment (or mapping) procedure that uses the concrete results of actions is only defined in the domain model description and there is not clue about how is going to be inserted in the personal portfolio. **The high level use cases don't cover this assessment procedure** that it is supposed to be in the use cases that should describe each specific action.

6.3 High Level Use Case: Keep up to date

Domain model support most of the functionality from this high-level use case. Two remarks:

- Maintaining the learner's proficiency is not an objective stated in the domain model description.
- Updates and changes received periodically for LAs and UOLs is not mentioned in the domain model description. However, notification services are envisaged in the domain model.

6.4 High Level Use Case: Reflect on Competences

Reflection report (or personal development plan) is not stated in the domain model description.

Estimate the proficiency levels at a given competence map is called 'positioning' (case of competence assessment, page 4). Can an actor determine manually competence levels?

6.5 High Level Use Case: Study for a new function or a new job

Main functionality of this use case is covered by the "Competence development Programme" class and the "Navigation Service" of the domain model.

However, we can find in the description of the use case other functionality that, at least, is not directly supported by the domain model:

- "The system should provide time intervals for the related learning actions and UOL according to user's learning profile"
- "Automatically created CDPs are provided by external navigation services"

Moreover, a **Facilitator** is mentioned in the use case and not in the domain model description. In general, **a better and more coherent description of all actors (author, learner, facilitator, etc.) is required**.

6.6 High Level Use Case: Want some Support

The domain model incorporates several services as action support, monitoring, positioning and navigation as well as classes for rating and comment knowledge resources and actions (learning units, learning activities, CDP) that are supposed to provide support to the user.

7 Are the proposed experiments adequate to validate our research?

The objective of this chapter is to analyse if the combination of all pilots planed in WP4 is enough to cover our seven research objectives.

It's important to take in account that we are now in the first stages of the project. Therefore some of the most advanced functionalities that will be offered in the future will be only available in a limited way in the first versions of the integrated system. In consequence, current pilots can not make an intensive use of such as functionalities so most advanced TENCompetence concepts and methods will not be validated in the first phase. For this reason, the findings and recommendations of this report will be of application for these initial pilots or should be taking in account in the design of the second cycle experimentation scenarios (see 13.2 Assessments WP4).

Just two pilots are planed in this first cycle (see D4.1 and ID2.1 for a detailed description of both pilots):

- Digital Cinema: a pilot about the new production workflow using digital cinema techniques and the new tools. This pilot address the next challenges:
  - Digital Cinema has real and urgent need for development of competences.
  - Digital Cinema involves the definition, development and management of an extensive and complex set of competences.
  - The competences required by the digital cinema industry are rapidly developing.
  - The actors involved in the Digital Cinema industry are geographically distributed.
  - Digital Cinema professionals require highly flexible training opportunities.
- ICT training pilot: this pilot tries to show how TENCompetence framework and approach can be applied for the implementation of the innovative and complex training methodology developed in the framework of "The Innovative Teacher" project [I*Teach.

Just when writing this report, new experimentation scenarios are being conceived for the second cycle. On one hand the Digital Cinema pilot will be extended with the Digital Cinema Game one. On the other, two more scenarios are under development. One in the city of Antwerp (health domain) and the other in the city of Cairo (water management domain). See TENCompetence-D41-v2-December2006 for details.

Next tables summarise how the research objectives are covered with the two first cycle pilots and which are the plans to complete this coverage in the second cycle.

7.1 Digital Cinema Pilot

TENCompetence aspect	TEN-Competence product	Digital Cinema Pilot validation	How addressed in the Digital Cinema pilot	Opportunities for additional validation
1) New, promising, innovative pedagogical approaches for lifelong competence development, supported by the TENCompetence infrastructure.	Integrated prototype. Learning activities prepared for the DC pilot.	The Digital Cinema pilot will use the cycle 1 infrastructure in an innovative pedagogic application. The pedagogic models being developed in WP 6 will be validated in cycle 2 pilots.	The DC pilot will use innovative pedagogies, resolving a real life training need in an emerging industry, which has pressing retraining needs. The use of recordings of shared desktop interactions will provide opportunities for innovation in both pedagogy and in the technically demanding integration of this form of data into learning activities. The richness of the TENCompetence system is such that no individual pilot can validate the whole range of potential applications. Consequently it would be reasonable here to run some smaller, more focused pilots, which explore the potential of the system to support innovative pedagogies.	Trials of the system to experiment with *specified* innovative pedagogies and contexts (e.g. open learning, discussion groups, problem based learning, learner led learning, etc). These may be small-scale trials, and if necessary can involve non-authentic contexts.
2) Tools to support individuals, groups and organisations in Europe to find the best solution for their formal or informal learning problem.	Products of WP 8.	The Digital Cinema pilot does not address this aspect, as these tools will not be incorporated in the system until cycle 2.	Apart from the lack of tooling, the level of institutional complexity required for a full validation of this aspect is not compatible with the validation of an initial prototype. It will be validated in Cycle 2.	Proposals have been made for the development of simulations to address this aspect, but no concrete plans are in place.
3) Policies and software agents that support the pro-active sharing of knowledge and learning resources.	Products of WP 5	The Digital Cinema does not address these aspects, as policies and software agents will not be available in Cycle 1. These aspects will be validated in Cycle 2.	It would be valuable in Cycle 1 to explore the potential of the TENcc client (and other available OS infrastructure) for: a) Supporting the pro-active sharing of knowledge and learning resources. b) Mapping learning resources to competences This would not only provide some initial proof of concept, but also provide a reference point, which will make it possible to evaluate the added value of subsequent additional functionality.	Focused trial of linked competences and learning resources in a context where there is a need for this functionality. Focused trial of system in a context where there is a need for peer sharing of resources. Trials could be in partner institutions.

4) Models and software tools to assess the competences of individuals, groups and organisations in an exchangeable way.	Products of WP 6 & 7.	The Digital Cinema does not address these aspects tools for assessing competences will not be ready by end of cycle 1. These aspects will be validated in Cycle 2.	Initial proof of concept for the exchange of competences would provide valuable additional information.	Mapping competences from an authentic context onto the formats to be used and validating their interoperability. In conjunction with formative evaluation carried out in WP6&7 this will provide a deep insight.
5) Software for the effective and efficient support of users who create, store, use and exchange knowledge resources, learning activities, units of learning, competence development programmes and networks for lifelong competence development.	TENcc prototype	Addressed by Digital Cinema cycle 1 pilot (DC pilot).	The DC pilot will provide the opportunity to use the full range of facilities built into TENcc client in an authentic learning environment, with authentic professional users. The creation of competence development programmes and networks for lifelong learning will only be addressed in a minor way in the DC pilot.	This could be addressed in less formal (and less mission critical) pilots. These could be combined with additional pilots for aspects 3 and 6.
6) Software solutions to establish a decentralized, self-organized and empowered management model when using the TENCompetence infrastructure.	TENcc prototype	Addressed by Digital Cinema pilot. Will need more pilots to validate the self-organisation aspect. This will be addressed in Cycle 2, in particular in the Antwerp pilot.	The DC pilot will be directed to a heterogeneous group of professionals working in the area of digital cinema. These people are both decentralised and self organised, and to this extent they provide a good opportunity for trialling the system. On the other hand the organisational structure is very flat, as they are all on the same level, and outside an institutional context. More functionality will be available to address this aspect in cycle 2. Nevertheless, it would be valuable to run a pilot where the potential of the TENC system for increasing self-organisation and empowerment among users could be examined, if an appropriate environment could be identified.	If an appropriate context can be identified, then the TENcc client to a number of professionals, with some guidance and facilitation support. The pilot would examine the use, which is made of the infrastructure in self-organised activities. This activity could be related to aspect 3) and 5) above.

7) Integrate isolated tools that are available in the field.	TENcc prototype	Addressed by Digital Cinema pilot Integration validated by the formal trials and technical tests and evaluation	The DC pilot will validate the integration of tools and services in the TENcc client by using them in an authentic eLearning task Technical evaluation and technical tests will also be carried out to ensure both integration of the tools and the overall performance and functionality of the system.	Incorporation of online help recording, and analysis of results

7.2 ICT Training pilot

ICT training pilot		
TENCompetence aspect	**TEN-Competence product**	**Proposed additional validation by the pilot**
1) new, promising, innovative pedagogical approaches for lifelong competence development, supported by the TENCompetence infrastructure.	Integrated prototype. Learning resources and activities prepared for the pilot.	In the additional SU pilots we are planning to involve new innovative pedagogical approaches – active learning, and concept and skill based approach for soft skills acquisition (I*Teach project approach and methodology).
2) tools to support individuals, groups and organisations in Europe to find the best solution for their formal or informal learning problem.	Products of WP 8.	We will try to validate the use of tools developed in I*Teach project (knowledge repository), and how well they can be incorporated inside the TENCompetence framework.
3) policies and software agents that support the proactive sharing of knowledge and learning resources.	Products of WP 5	Existing knowledge repositories containing educational resources will be tested and validated how well they can be used for sharing knowledge resources inside TENCompetence framework.
4) models and software tools to assess the competences of individuals, groups and organisations in an exchangeable way.	Products of WP 6 & 7.	The competence model based on the I*Teach learning methodology will be tested how well it can be expressed and used inside TENCompetence framework.
5) software for the effective and efficient support of users who create, store, use and exchange knowledge resources, learning activities, units of learning, competence development programmes and networks for lifelong competence development.	TENCompetence prototype	All existing tools integrated inside TENCompetence framework will be tested, and also incorporation of some new existing tools inside |TENCompetence framework will be also tested and validated.
6) software solutions to establish a decentralized, self-organized and empowered management model when using the TENCompetence infrastructure.	TENCompetence prototype	Will test the TENCompetence approach and TENCompetence with different group of users from more rich and diverse competence development programme.
7) integrate isolated tools that are available in the field.	TENCompetence prototype	Integration of additional I*Teach based tools will be tested.

7.3 Concluding Remarks

When analysing both tables, we can notice that some parts of the objectives are covered by both pilots in the first cycle and that the planning extensions are enough to cover all of them in the second cycle. Therefore, **WP4 works in the right direction**.

However, it seems that much of the TENCompetence objectives are missing from the Digital Cinema (use of innovative pedagogies, competence assessment procedures, polices for encouraging collaboration, integration with learning on the job, etc.). At this moment, attempts are made to introduce more elements of the seven research objectives into this initial pilot.

A final recommendation is related with the actors described in the pilots that have not a direct equivalence with those defined in the domain model or in the high level use cases.

8 Conclusions & recommendations

In preceding chapters, a cross-analysis has been made between four project core issues: the domain model, research objectives, high level use cases and pilots. Instead of offering an exhaustive list of encountered gaps, the objective of this last chapter is to highlight those more relevant as well as to present some recommendations that may drive the next development phases.

In first place, it's important to highlight that our underlying theory, the domain model, **provides a good reference for research within the TENCompetence**. It provides a high-level separation of concerns and a **vocabulary** that can be used by all project partners. As it is almost unavoidable at this early stage of the project, the domain model is quite general and provides mainly pointers as to where the research results on the core objectives need to be fit in. We expect that this will be elaborated at later stages of the project. Especially important will be a **better description of the relations between classes as well as the interchanged data.**

Regarding the said vocabulary, several incoherencies have been found between the names and descriptions used in the domain model, high level uses cases and pilots (consider, for example, the multiple definitions of actors that is possible to find in pilots or use cases)**. Efforts for integrating terms and definitions in a unique glossary are required**. This will provide the involved researchers with a common view for exchanging insights and results.

A second remark is related to the fact that domain model and high level uses cases **hardly represent how the available resources may be created and managed**. Tools for creation and management are not covered by the use cases and should be included in the next phase (Elaborated Use-case Model; ID2.4). Therefore, w**e would strongly advice to also consider the author perspectives.**

Another important issue is that the high level use cases mainly describe formal learning activities. It is implicitly assumed that learners will make use of formal units of learning to reach their goals. Informal learning has not been described detailed enough. **C**onsequently, **more stimulating scenarios on informal learning should be provided.** In addition, **competence assessments should be use for tailoring informal learning resources too**.

Going further, high level uses-cases offer support to learners or employees to select most suitable actions to reach a goal. However these actions refer to Learning Networks, Competence Development Programme, Learning Activities or Unit of Learning **forgetting Knowledge Resources that are essential in informal learning scenarios.** Services as an **external resources access tool**, a **version managing system** or **organizational services** as peer reviewers for guarding the quality of the resources should be useful as well. In the same way, a better **definition of more complex relationships between actors** (i.e. dependencies) or the **definition of workflows** (i.e. approve or deny the launch of pedagogical activities or the subscription to a learning network) should enrich the model.

Moreover, in spite of communication and collaboration tools are mentioned, there are not implementations or references to stimulating mechanisms of knowledge sharing, All use cases are centred on the learner wanting to reach a goal for him or her-self. They describe the learner as someone who consumes rather than contributes it. **More details about how the system will stimulate the sharing of knowledge resources are required**.

In this sense, the high level use cases are quite goal-directed and aimed at improving one's competence level, or to stay up-to-date. What is interesting to observe, is that the use cases have a very learner-centred perspective: instead of describing how a learner selects material from the available resources the use cases describe the learner pursuing a specific goal. **The competence-based approach** – in which the learner can express interest in improving certain competences, keep up-to-date for a certain profession or reflect on his/her current competence levels– **seems to be a good basis for new approaches and is in line with current literature on lifelong learning**.

However, it's also evident that there is **a clear lack in relation with the research in scenarios in which innovative pedagogical models take part of**. Therefore, we strongly recommend **making more explicit the research in those scenarios in future description of work** (DIP-2). We also **encourage WP4 to take in account this remark in the design of future experimentation scenarios**.

Finally a more technical remark is related to the **ePortfolio definition and the logging process of learners' activities**. It seems that ePortfolio is an external service (both in domain model and in the use cases). But, it is also clear that an internal representation of this item is required for storing learning activities at a minimum. This incoherence has to be solved to avoid the risk of duplicating work as several research groups should deal with this issue that seems not be part of any of them.

9 References

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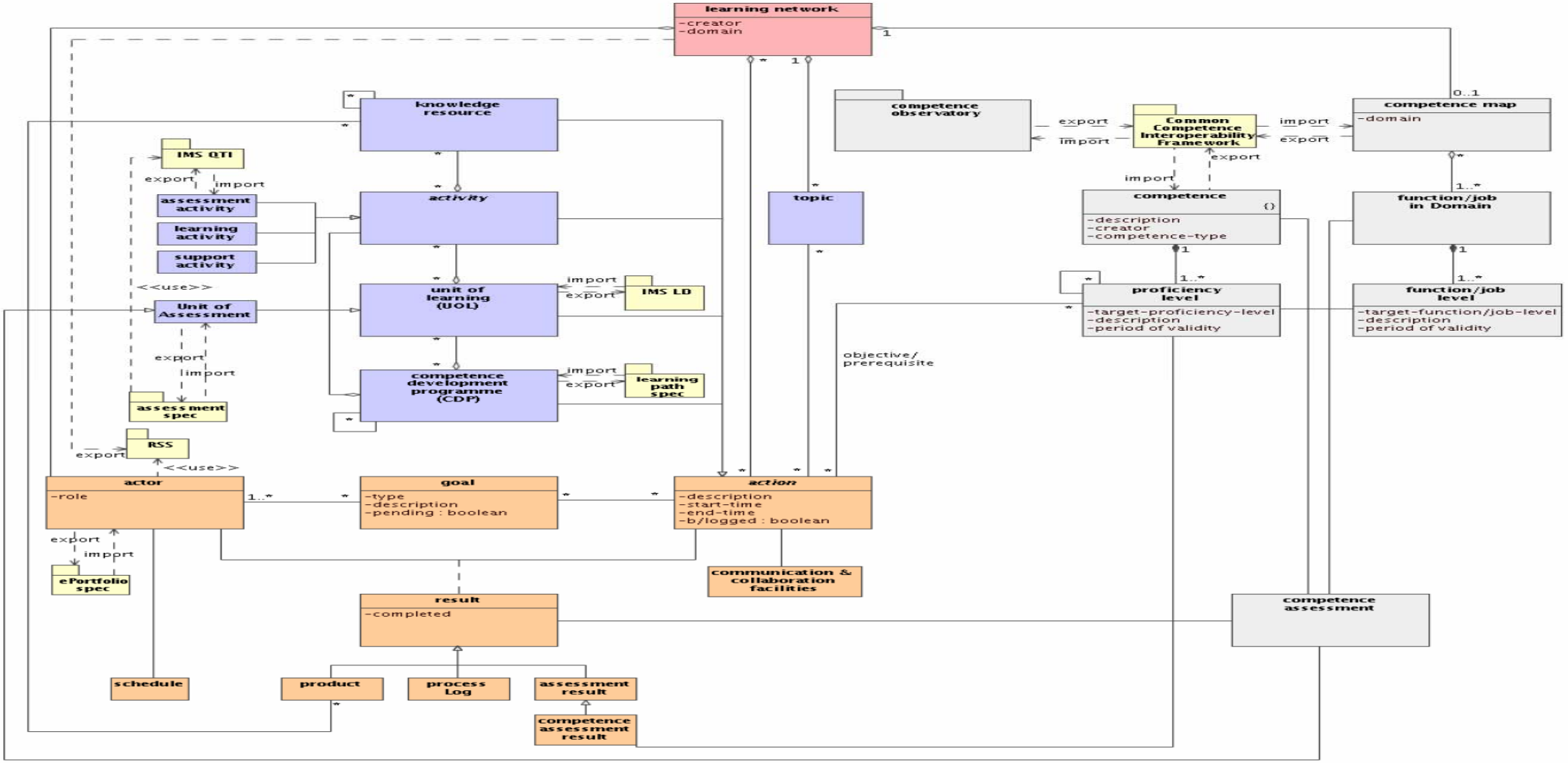
- Unified-Scenarios Based Design, Alex Donateli (IBM)

10 Appendix A: Domain Model

Figure : Domain Model v1 19-06-06.



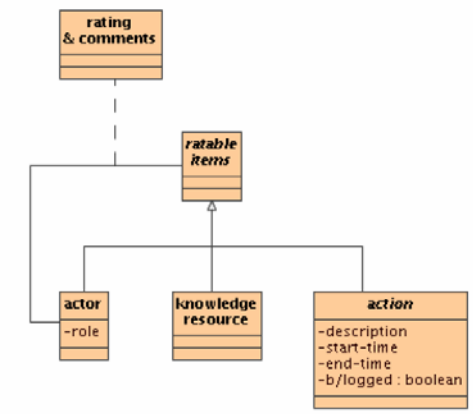


Figure 3: Packages with functionality to be elaborated in future releases

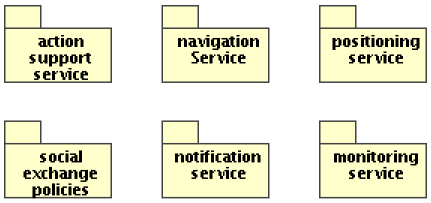


Figure 4: Ratings

11 Appendix B: High Level Use Cases

The High Level Use Cases that are described in the Initial Requirement report are six:

1. Explore a Learning Network.
2. Improve a Proficiency Level.
3. Keep up to date.
4. Reflect on competences.
5. Study for a New function or a New job.
6. Want some support.

Use-Case models have been created for each one as follows:

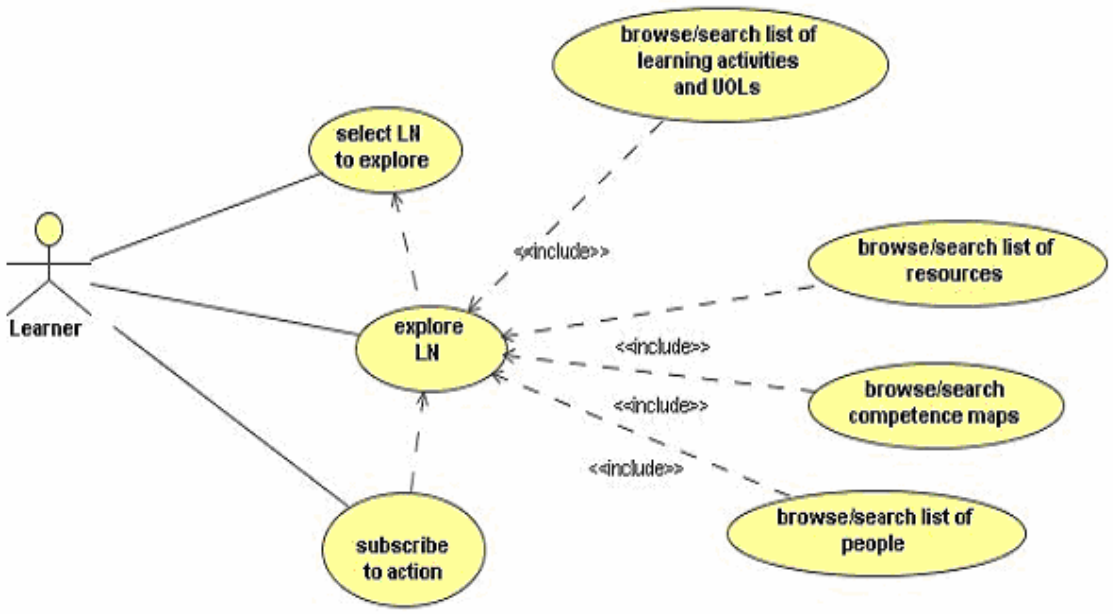


Figure 5: Explore a Learning Network

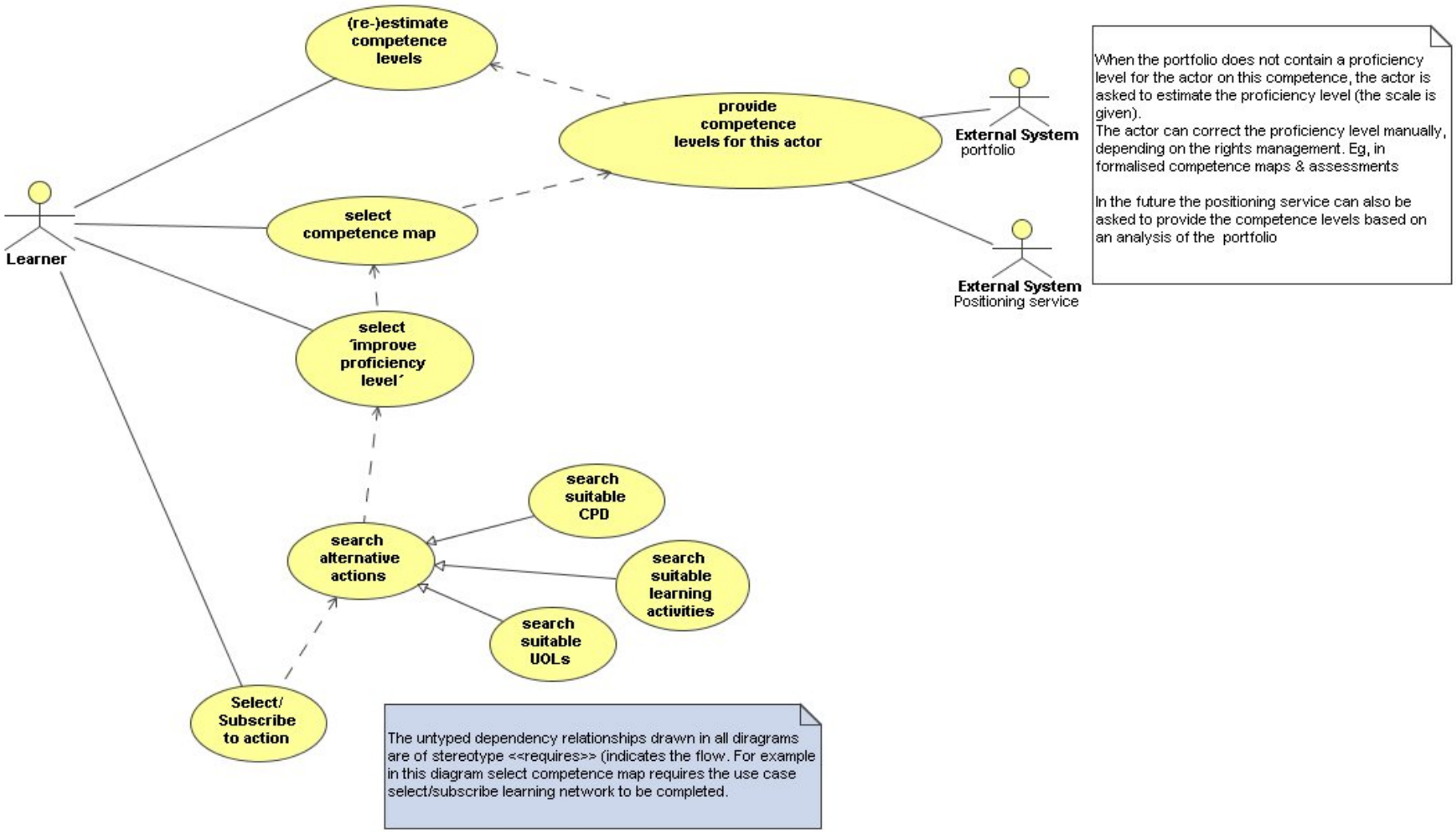


Figure 6: Improve Proficiency Level

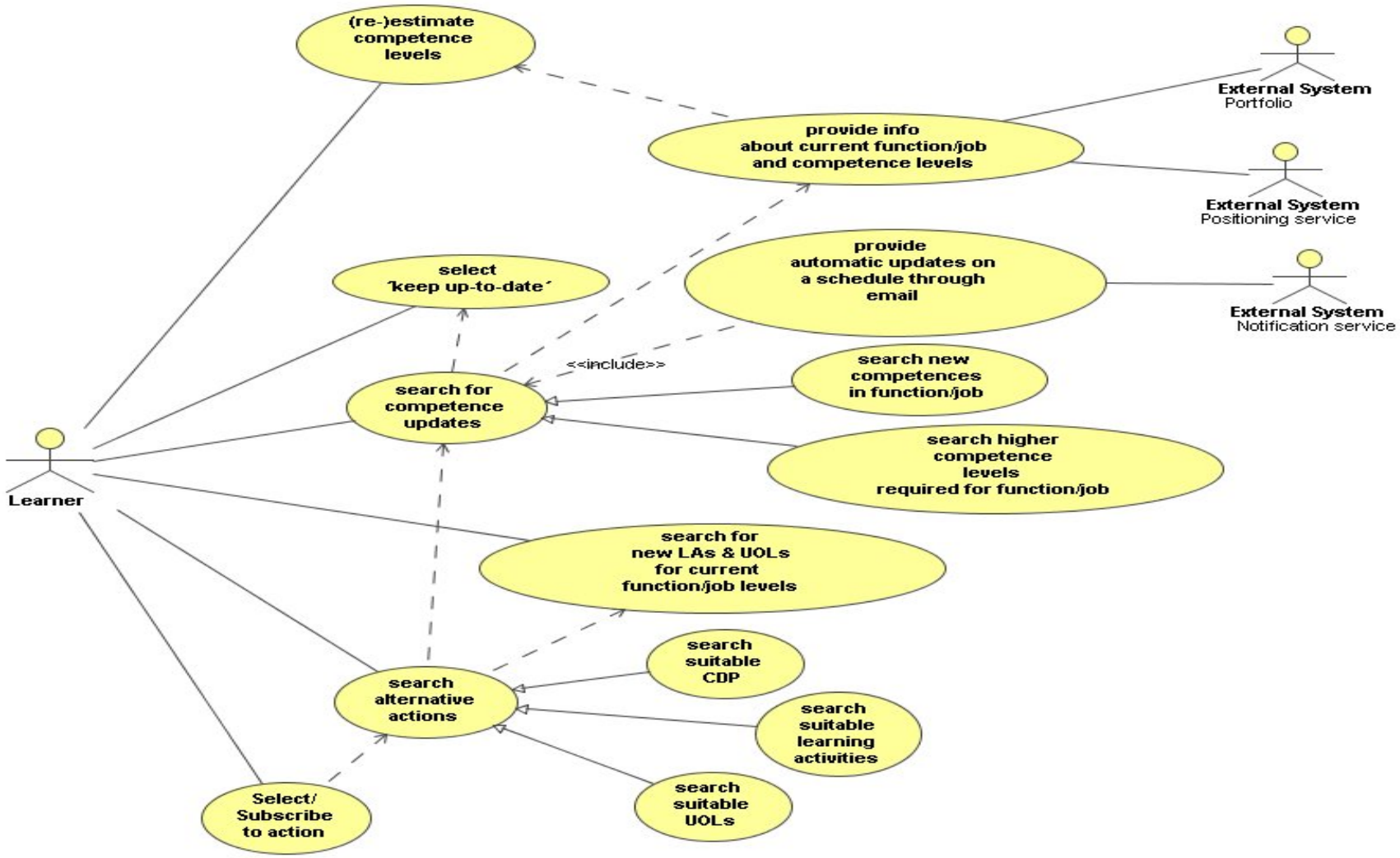


Figure 7: Keep up to date.

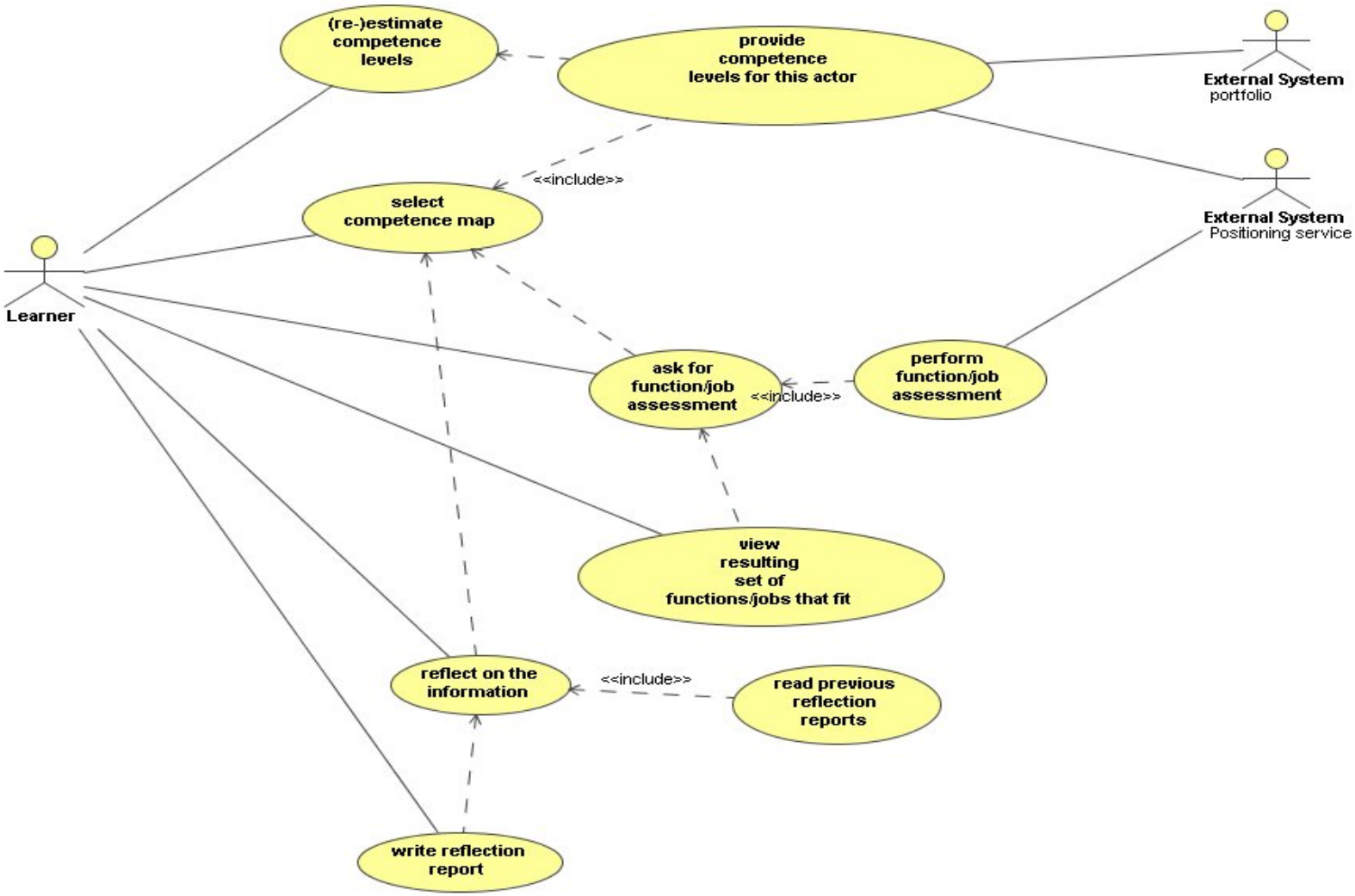


Figure 8: Reflect on competences

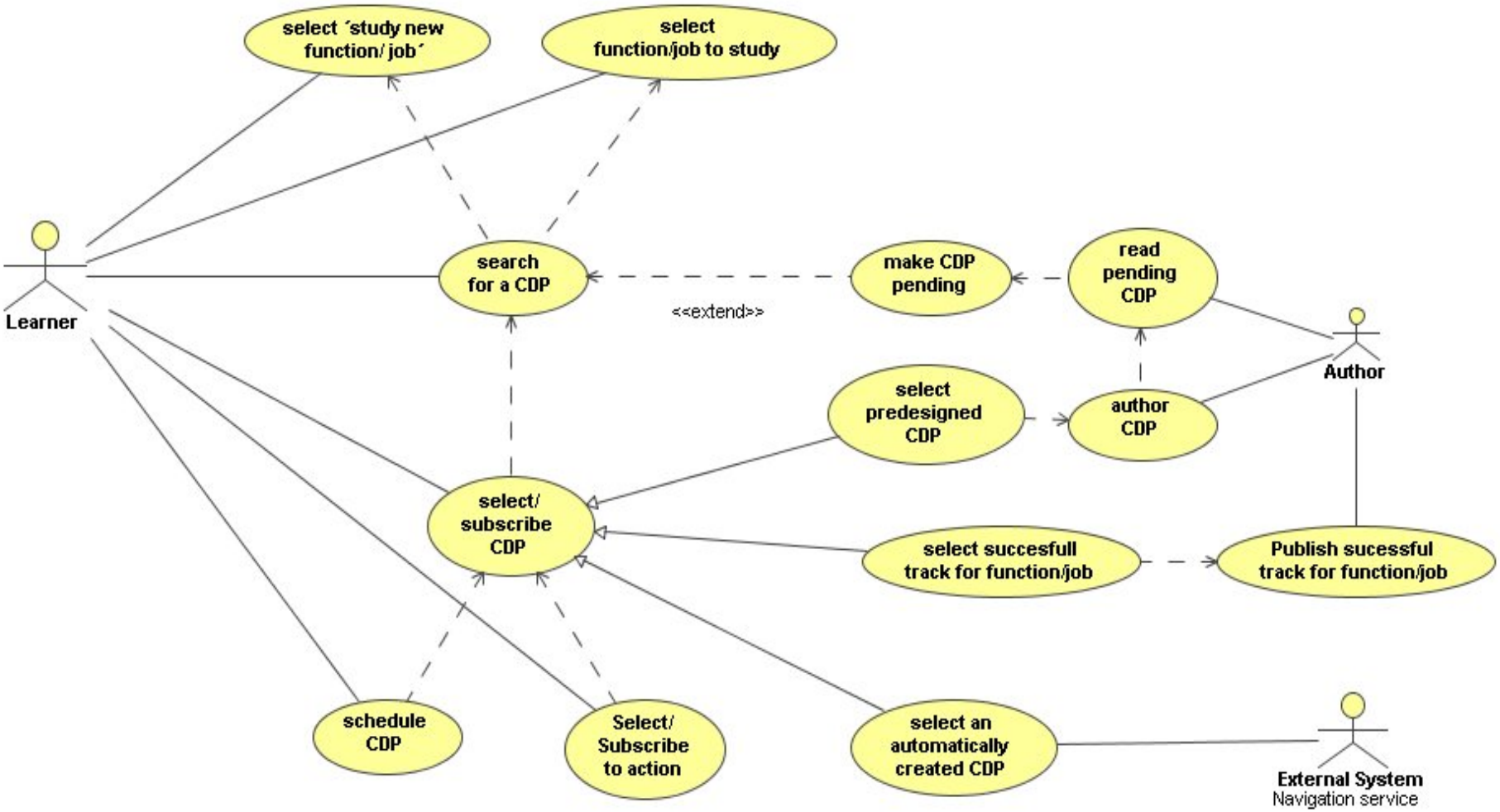


Figure 9: Study for a New function or a New job

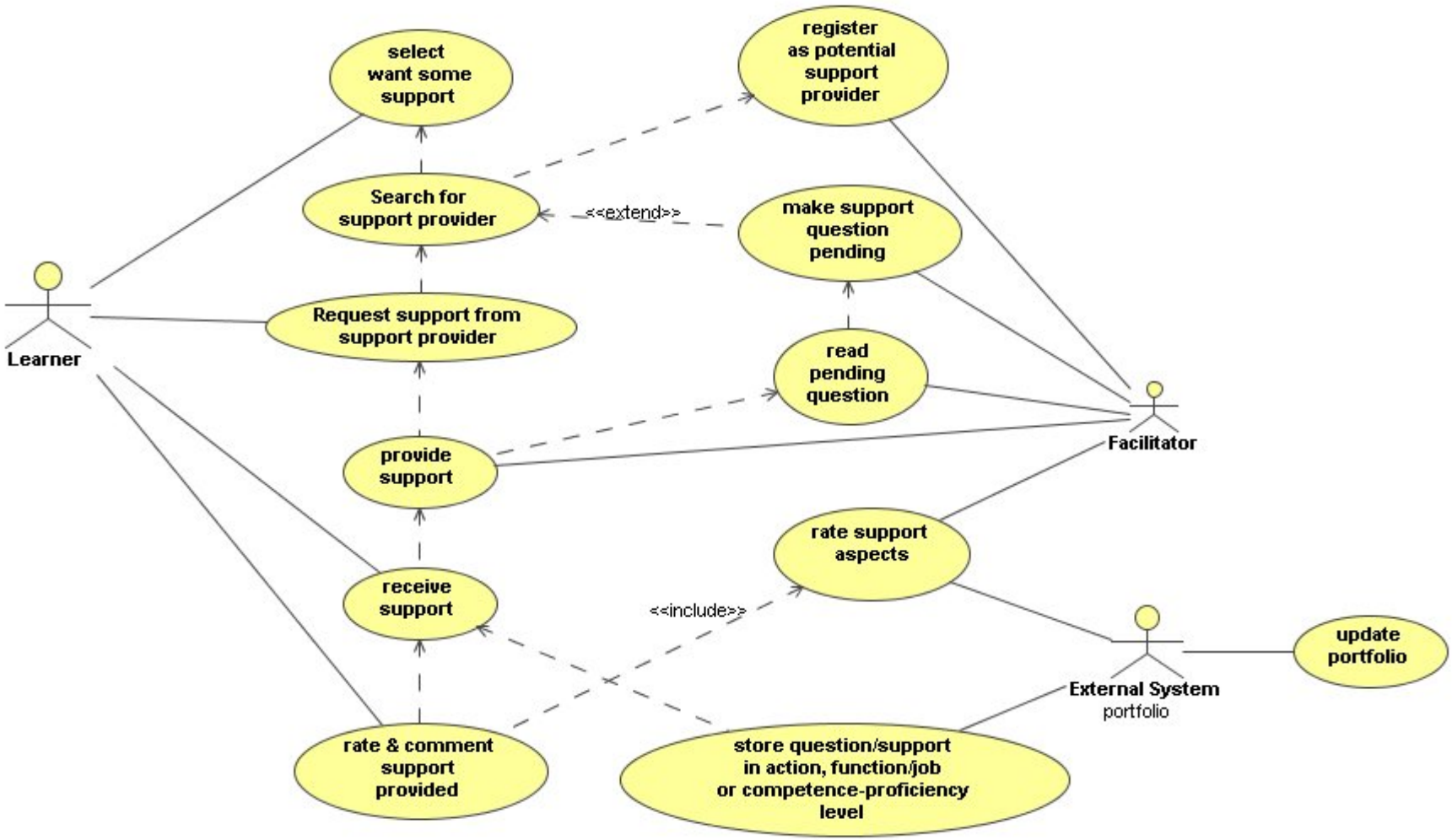


Figure 10: Want some support

12 Appendix C: Aspects

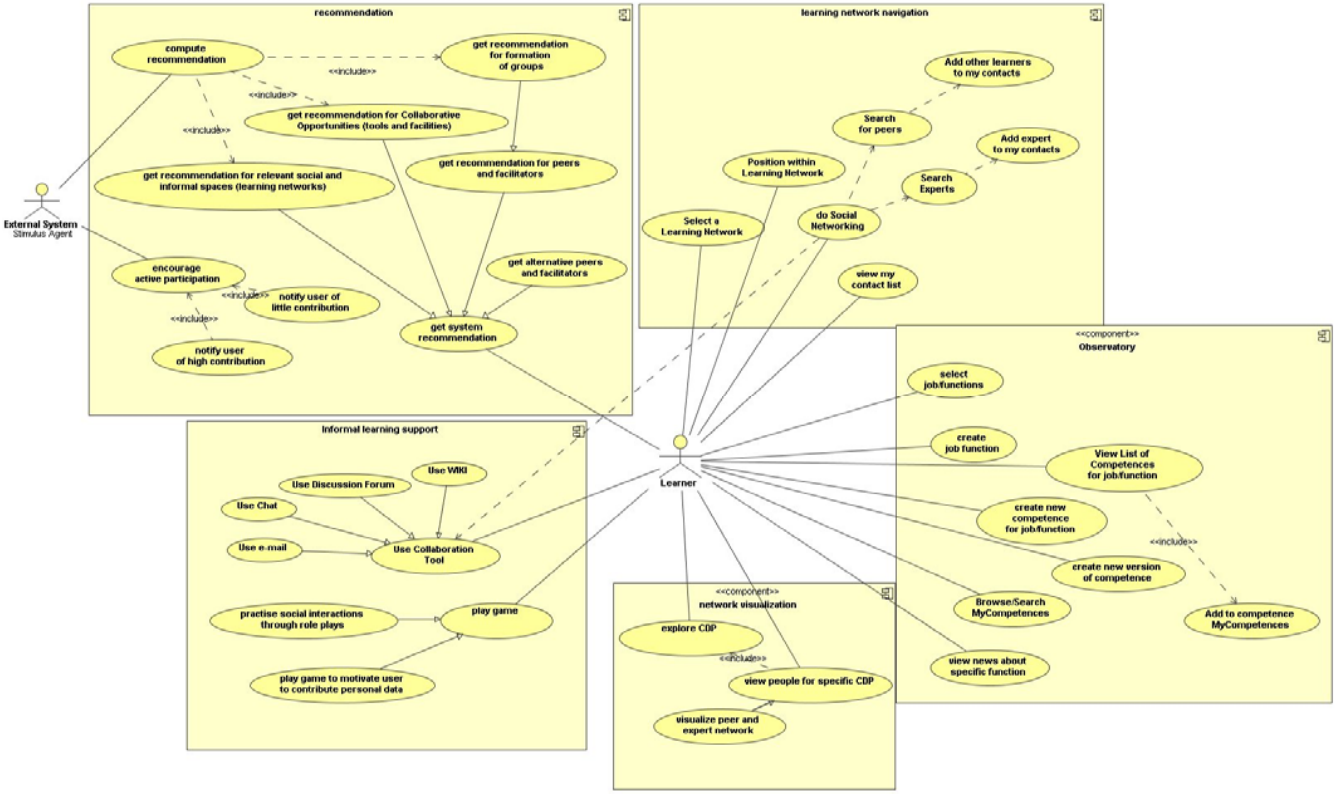


Figure 11: Learning Networks

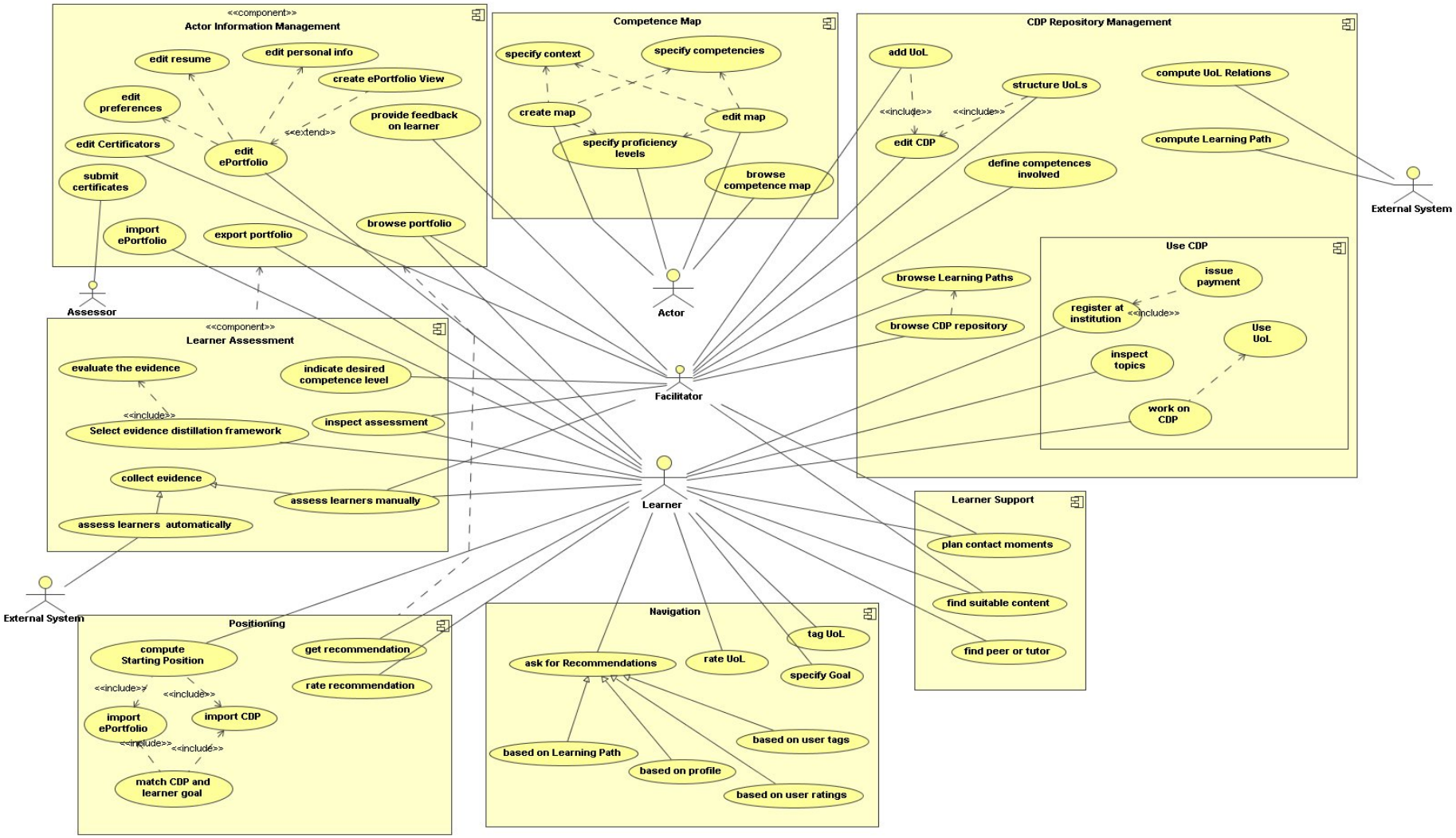


Figure 12: Competence Development Programmes

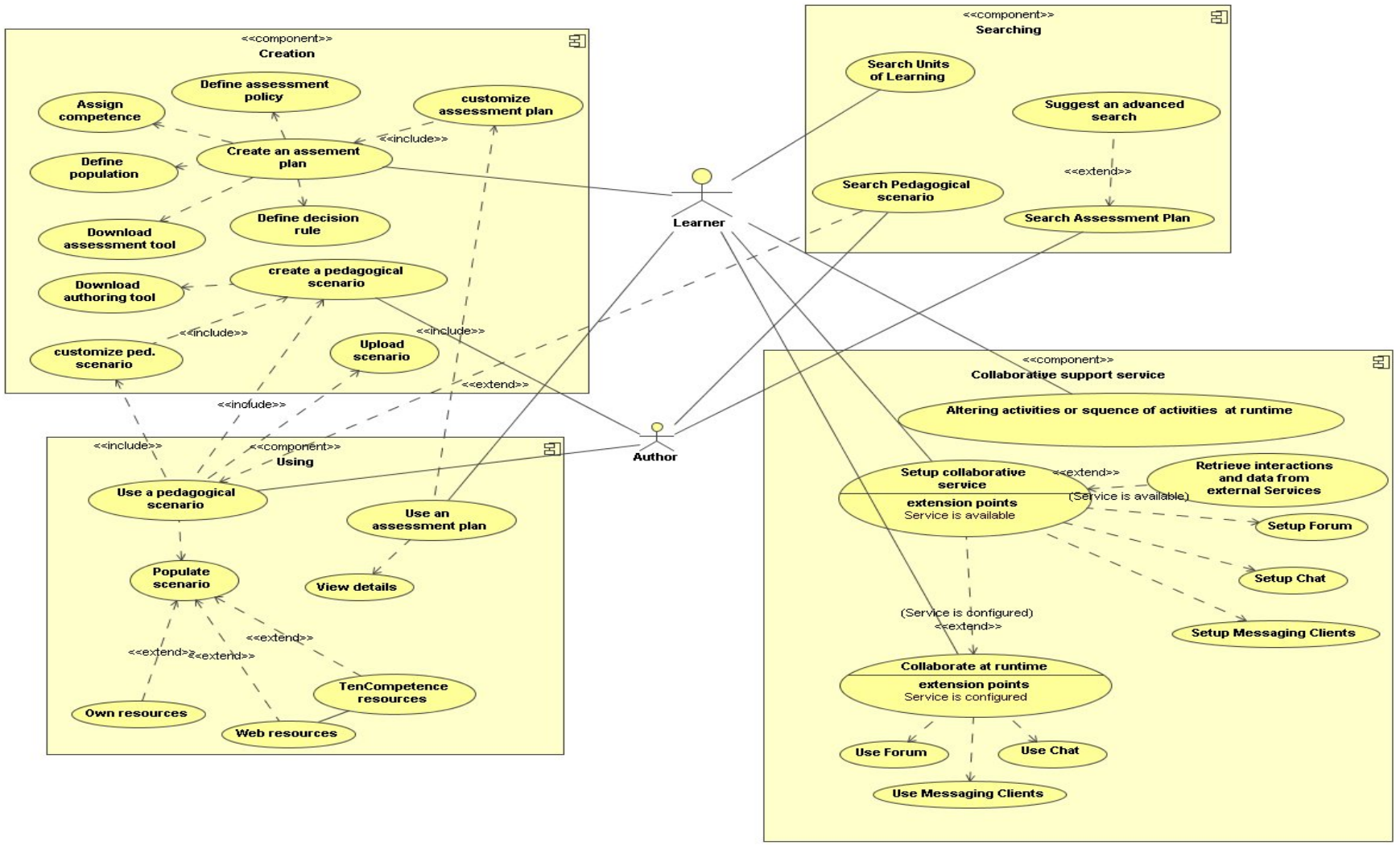


Figure 13: Units of Learning & Learning Activities

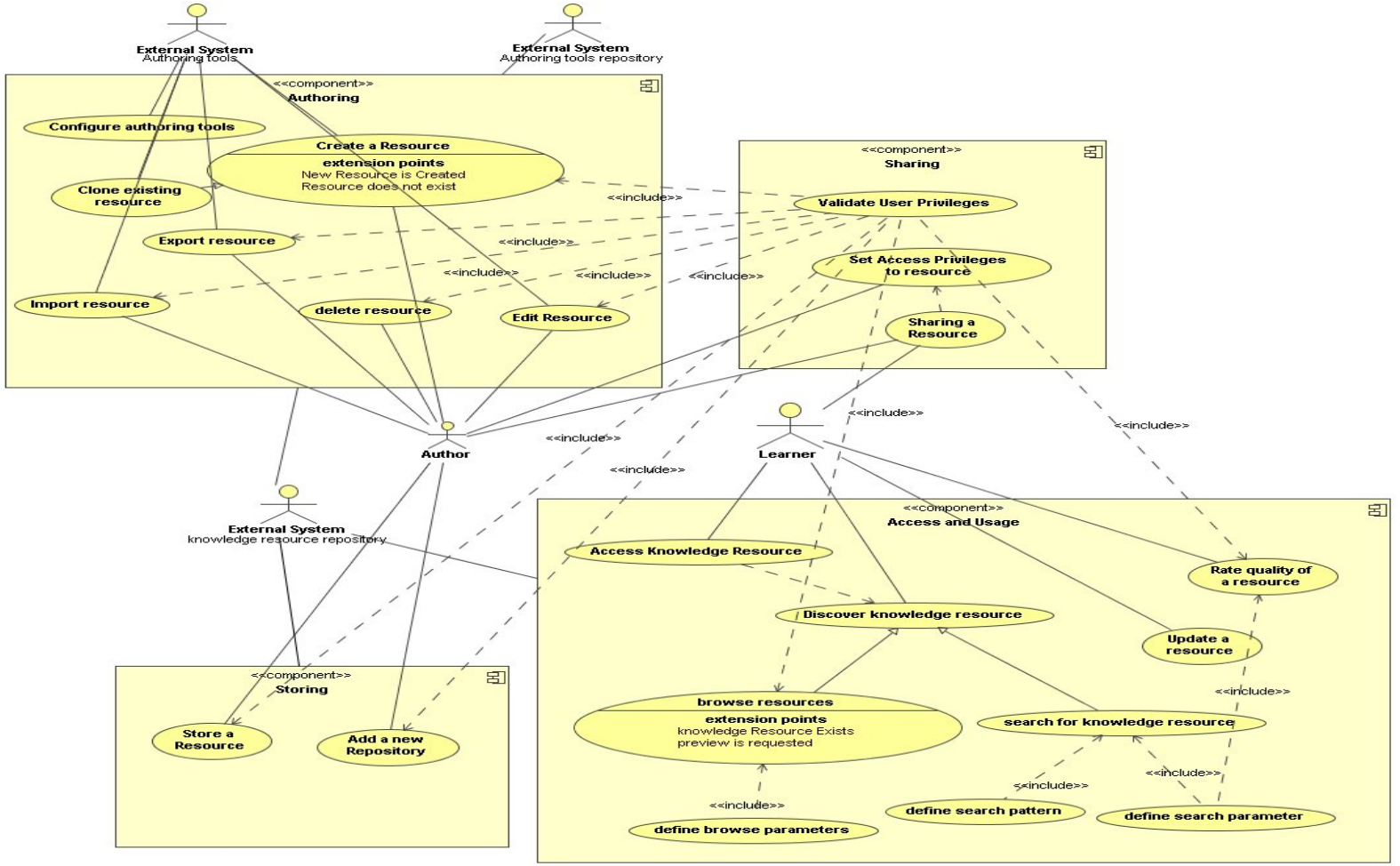


Figure 14: Knowledge Resources

13 Appendix D: Assessment from WP3 and WP4

13.1 Assessments WP3

The analysis report describes the results from a consistency analysis between the domain model, the high level use cases, the aspect use cases, the project objectives and the WP4 pilots. This consistency analysis can result in updates to one or more of those items, to improve their quality. As the mentioned documents (except the domain model) are not in use by WP3 yet, changes to them do not affect WP3's work. Checking if the consistency analysis is complete and/or correct by WP3 would mean studying all those draft items first and then checking the consistency analysis. That would take a lot of time and, more important, it's not a task for WP3 because deep knowledge about WP2 and WP5-8 is required to do a thorough quality assessment. There is no system perspective to assess; WP3 can only try to do a quality check.

Conclusions and recommendations:
Keep track of the various 'gaps' throughout the project, at regular intervals, thus to monitor to what extent gaps are filled (compared to some start, or intermediate situation), what is still to be done, and what new gaps can be distinguished, the latter as we are riding towards still partly unknown horizons. It fits the iterative and incremental approach.

13.2 Assessments WP4

In general these seem very relevant and focused on identifying gaps.

It shows that **much of the TENCompetence objectives are missing from this pilot: these are clear gaps. At this moment, attempts are made to introduce more elements of the seven objectives into the Digital Cinema Pilot**.

Availability and functionalities of the TENCompetence infrastructure
The following aspects of TC infrastructure seem to be present in the Digital Cinema Pilot:

- working with learning resources,
- combining these to units of learning,
- combining these to competence development programmes.

The following aspects of the TC infrastructure seems to be absent in the Digital Cinema Pilot:

- The TENCompetence technical infrastructure;
- Innovative pedagogies, including the following elements:

    1. Assessing the entrance level (= entrance competence assessment, validation of prior learning), and letting people enter the CDP at their own level
    2. Specific policies and software agents for encouraging collaboration among learners
    3. Criterion-based assessment, following the learner over a longer period of time; measuring not only their scores on units of learning, but also their progress in competence proficiency level
    4. Integration with working-on the-job: no involvement of organisations, no exercises at the job, no competence assessment which involved working-on-the-job
    5. Emphasis on evidence collection
    6. Large degree of freedom of choosing CDPs by the learner.